

# Heart

A brief discussion of the structure and function of the heart and a classification of cardiac murmurs facilitates understanding the difference between normal and abnormal cardiac conditions in CKCS.

Each side of the heart has three chambers separated by two valves. On the right side of the heart, the right atrium receives deoxygenated blood from the body and transmits it to the right ventricle. The right ventricle pumps the blood into the pulmonary artery and then the lungs. The tricuspid valve separates the right atrium from the right ventricle and the pulmonary valve separates the right ventricle from the pulmonary artery. After blood is oxygenated in the lungs, returns to the left atrium and is pumped to the body by the left ventricle by way of the aorta. The mitral valve separates the left atrium from the left ventricle and the aortic valve separates the left ventricle from the aorta.

Heart murmurs are vibrations caused by turbulent blood flow across structures inside the heart. Murmurs are classified in three ways: *first*, according to the valve causing the vibration; *second*, by the timing of the vibration in relation to the pumping function of the heart, and, *lastly* by the intensity (or grade) of the murmur. There are six grades of cardiac murmurs:

1. The faintest murmur, heard only in an extremely quiet room with a good stethoscope with a still and quiet patient with complete concentration by the listener.
2. A faint murmur, but can be easily heard with additional concentration by the listener.
3. A moderately loud murmur, easily heard.
4. A very loud murmur.
5. An extremely loud murmur, which can be heard with the stethoscope lightly touching the skin.
6. The loudest murmur, which can be heard with the stethoscope not touching the chest wall. This murmur can also be felt (palpated).

## Common Heart Murmurs Heard in CKCS

There are several types of heart murmurs heard frequently in CKCS. They may be innocent, flow murmurs not suggestive of disease, or pathologic, indicative of genetic, inheritable valvular heart disease.

**Innocent, flow murmurs.** These murmurs are caused by normal turbulent blood flowing across heart valves of young dogs. These low-grade murmurs (less than a grade 2) decrease with age as the heart matures and are not associated with congenital heart disease.

**Murmurs associated with heart disease.** CKCS are susceptible to abnormalities of heart valves on both the right and left side of the heart. These abnormalities may be present and evident at birth and therefore are considered congenital. Examples of these include aortic and pulmonary stenosis and the patent ductus abnormality. Mitral valvular disease is considered separately and is felt to represent an adult (mature dog) onset, representing genetic heart disease. The valve itself is normal at birth, but in some dogs degenerates prematurely and sometimes rapidly, leading to disease.

Careful physical examination and additional testing facilitates the diagnosis in a young, asymptomatic dog. Over time, progressive deterioration of the congenitally abnormal valve produces symptoms. Narrowing of the pulmonary valve (stenosis) is the most common valve affected on the right side of the heart. On the left side of the heart, both the mitral valve (leaking or regurgitation) and aortic valve (narrow or stenosis) may be affected.

*Pulmonary Stenosis.* Stenosis of the pulmonary valve produces a systolic murmur heard on the right side of the sternum. The intensity of the murmur is proportional to the severity of the narrowing of the valve and enlargement of the right ventricle. In mild cases, one may only hear a grade 1 or 2 murmur. In more pronounced stages, the dog may develop right-sided heart failure with peripheral edema. In its most severe form, the pulmonary valve is severely deformed and narrowed and the right ventricle enlarged and weak. The right ventricle then fails and cannot pump blood to the lungs, a fatal condition.

*Mitral Value Disease.* Malformation of the mitral valve is characterized by valvular thickening and redundancy

and/or degeneration of the muscles which support the valve. These structural changes allow the blood to leak backward from the left ventricle into left atrium during the pumping action of the left ventricle. This systolic murmur is best heard on the left side of the sternum. Progressive leaking leads to enlargement of the left atrium and ventricle. As blood floods the lungs, the animal develops exertional shortness of breath, and has decreased exercise tolerance. Eventually heart failure results.

*Aortic Stenosis.* Narrowing of the aortic valve produces a systolic murmur best heard on the left side of the sternum. Similar to pulmonary stenosis, the intensity of the murmur correlates with the degree of severity of the narrowing of the valve. With progressive narrowing, the left ventricle enlarges and thickens in an effort to generate sufficient pressure to propel the blood forward into the aorta. Eventually the left ventricle fails and is unable to eject blood to the body. The murmur is then is barely audible.

*Patent Ductus Arteriosus.* Before birth, blood bypasses the deflated lungs through the ductus arteriosus, a hollow blood vessel connecting the pulmonary artery and the aorta. At birth, the lungs inflate and the ductus arteriosus closes, thereby separating the pulmonary and systemic blood flow circuits. In rare situations, the ductus arteriosus fails to close (a patent ductus arteriosus) and blood flows from the aorta to the pulmonary artery when the left ventricle contracts (systole) and from the pulmonary artery to the aorta when the left ventricle relaxes (diastole). The murmur is continuous, heard in both systole and diastole, on both sides of the sternum. The loudest component is the systolic murmur. A patent ductus arteriosus results in excessive pressure and volume of blood in the lungs. Eventually, both sides of the heart fail.

### **Guidelines To Reduce The Incidence Of Mitral Valve Disease**

At the 1998 symposium, the panel reported that mitral valve disease is the leading cause of death of Cavalier King Charles Spaniels. Cavaliers are 20 times more prone to have MVD than other breeds. It is hereditary, passed on from generation to generation by the parents, grandparents, and earlier ancestors of our dogs.

The panelists concluded that, ideally, Cavaliers should be 5 years of age or older and heart-clear when they are first bred. However, recognizing the problems associated with breeding females for the first time at 5 years of age, the following was recommended as a secondary approach to reducing the incidence of MVD:

*The Brood Bitch should be a minimum of two and a half years old with a clear heart and with both parents with clear heart certificates issued at five years of age or older.*

*The Stud Dog should be a minimum of two and a half years old with a clear heart and with both parents with clear heart certificates issued at five years of age or older.*

*All clear heart certificates must be signed by Board Certified Veterinary Cardiologists.*

*To use an older stud dog with a clear heart certificate issued as late in life as possible is highly desirable. However, an older dog with a slight murmur should not be ignored. It is strongly advised that breeding stock under 5 years old be limited to those with clear heart certificates.*

The extent of MVD can be decreased, and the age of onset can be delayed, by breeding only Cavaliers which have been examined by Board Certified Veterinary Cardiologists at age 2 1/2 years or older and found free of MVD murmurs, AND whose parents were similarly examined at age 5 years or older and found to be murmur-free. We refer to these dogs as being "Heart-Clear".

Raising the age of onset of MVD should be every breeder's immediate aim. The best way to approach this is to select breeding stock with good heart records behind them. It is strongly recommended that ALL Cavaliers be auscultated (examined with a stethoscope) by a Board Certified Veterinary Cardiologist at 2 1/2 years of age or older and annually thereafter, especially within a year of being bred, and the results submitted to the Health Registry.

These guidelines are based on the current recommendations of geneticists and cardiologists and may be updated and reissued by the Cavalier King Charles Spaniel Club, USA when further research becomes available.

### **CKCSC'S Ongoing Commitment To Healthy Cavaliers**

- The CKCSC has initiated an [Open Health Registry](#) where heart certificate results and other health related results for Cavaliers in North America and Canada, from any registry recognized by CKCSC, can be listed. For more information on the Open Health Registry go to Open Health Registry (link to the Introduction to the Open Health Registry). To download the Health Registry form from our website, [go here](#).
- By initiating and financially supporting this Open Health Registry, CKCSC hopes that the current incidence of Mitral Valve Disease (MVD) (roughly 50% of Cavaliers aged 5 years and approx 98% of 10 years, are affected with MVD) can be substantially reduced starting with the offspring of the first generation of Cavaliers who take part in the Open health Registry program. Significant progress can be measured on an annual basis, as seen by the number of 5 year old heart-clear Cavaliers listed on the Open Health Registry.
- CKCSC encourages Regional Clubs to set up Cavalier Health Days at veterinary clinics whereby Cavaliers can be examined by trained specialists for heart problems and other disorders. CKCSC will subsidize these clinics to provide economical health examinations for our Cavaliers.

*The assistance of John Bonagura, DVM, MS, Professor and Head of Clinical Cardiology Services, College of Veterinary Medicine, Ohio State University, is greatly appreciated in review of this synopsis.*

**View:**

[CKCSC Health Registry, 5+ Year Clear Heart](#)  
[CKCSC Open Health Registry](#)

**List of Cardiologists:** <http://www.acvim.org/Specialist/Search.aspx>

**Links:**

**Orthopedic Foundation for Animals (OFA):** <http://www.offa.org>  
**Canine Health Information Center (CHIC):** <http://www.caninehealthinfo.org/>

**Look up any Kind of Health Problem:**

<http://www.vetinfo.com/dogindex/html>

**American Animal Hospital Association:** <http://www.aaaha.org/misc/terms.shtml> - insert info you want to find in "Keywords" at top of home page on the site.